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ABSTRACT

Focusing on railroad occupations, this document is one in a series of forty-one reprints from the Occupational Outlook Handbook providing current information and employment projections for individual occupations and industries through 1985. The specific occupations covered in this document include brake operators, conductors, locomotive engineers, shop trades, signal department workers, station agents, telegraphers, telephoners, tower operators, and track workers. The following information is presented for each occupation or occupational area: a code number referenced to the Dictionary of Occupational Titles; a description of the nature of the work; places of employment; training, other qualifications, and advancement; employment outlook; earnings and working conditions; and sources of additional information. In addition to the forty-one reprints covering individual occupations or occupational areas (CE 017 757-797), a companion document (CE 017 756) presents employment projections for the total labor market and discusses the relationship between job prospects and education. (BM)

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Railroad Occupations

CE

Reprinted from the
Occupational Outlook Handbook,
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U.S. Department of Labor
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Containing the midpoints of the legs of right triangle *RST*, where pt. $(-5, 5)$, S is pt. $(1, 1)$, and T is pt. $(3, 4)$.

Containing the longer diagonal of a quadrilateral whose vertices pts. $(2, 2)$, $(-2, -2)$, $(1, -1)$, and $(6, 4)$.

Show that the equations $y - 1 = \frac{1}{2}(x + 3)$ and $y - 4 = \frac{1}{2}(x$ are equivalent.

An equation of the line containing pts. $(-2, 3)$ and $(4, -1)$ ca written in the form $y - 1 = -\frac{2}{3}(x + 2)$ or in the $y + 1 = -\frac{2}{3}(x - 4)$, depending upon which point you take a (x_1, y_1). Show that the two equations are equivalent.

Show that the equations are equivalent.

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1) \qquad y - y_2 = \frac{y_1 - y_2}{x_1 - x_2}(x - x_2)$$

State the equation of a line through pt. (p, q) and parallel to a containing pts. (a, b) and (c, d). $(a \neq c)$.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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OCCUPATIONS IN THE RAILROAD INDUSTRY

Trains are one of the most efficient methods of transporting large amounts of freight over distances exceeding several hundred miles. Locomotives can pull thousands of tons of cargo using fewer employees and far less fuel than trucks and airplanes. In 1976, the railroads hauled 1.4 billion tons of freight, and carried 271 million passengers as well.

With 531,000 workers in 1976, the railroads were one of the Nation's largest employers. Railroad workers operate trains, build and repair equipment and facilities, provide services to customers, and collect and account for revenue. In most nonprofessional jobs, seniority systems prevail—workers start at the bottom and work their way up.

Nature and Location of the Industry

The railroad industry is made up of "line-haul" railroad companies that transport freight and passengers and switching and terminal companies that provide line-haul railroads with services at some large stations and yards.

About 95 percent of all railroad employees work for line-haul companies that handle about 99 percent of the industry's business. The remainder work for switching and terminal companies. Most railroad revenue and employment comes from freight. Passenger service has declined substantially in the past 30 years, because the railroads have not been able to compete with the speed of the airlines or the convenience of private automobiles.

Railroad workers are employed in every State except Hawaii. Large numbers work at terminal points where the railroads have central offices, yards, and maintenance and repair shops. Chicago, the hub of the Nation's railroad network, has more railroad employees than any other area, but many employees also work at the major railroad operations centered near New York, Los Angeles, Philadelphia, Minneapolis, Pittsburgh, and Detroit.

Trains are one of the most efficient methods of transporting large amounts of freight.

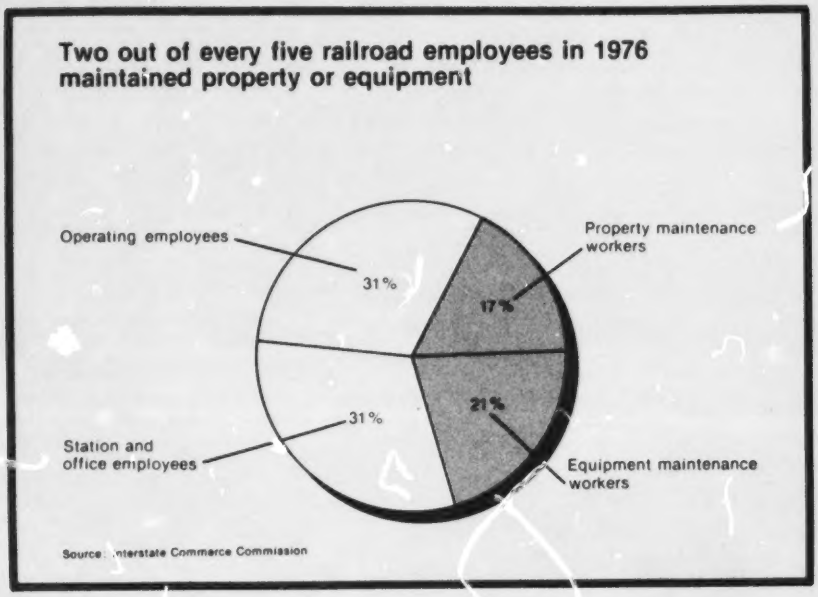
Railroad Occupations

Railroad workers can be divided into four main groups: Operating employees; station and office workers; equipment maintenance workers; and property maintenance workers.

Operating employees make up almost one-third of all railroad workers. This group includes locomotive engineers, conductors, and brake operators. Whether on the road or at terminals and railroad yards, they work together as traincrews. Also included are switchtenders who help conductors and brake operators by throwing track switches in railroad yards and hostlers who fuel, check, and deliver locomotives from the engine house to the crew.

One-fourth of all railroad workers are *station and office employees* who direct train movements and handle the railroads' business affairs. Professionals such as managers, accountants, statisticians, and systems analysts do administrative and planning work. Clerks keep records, prepare statistics, and handle business transactions such as collecting bills and adjusting claims. Agents manage the business affairs of the railroad stations. Telegraphers and telephoners pass on instructions to traincrews and help agents with clerical work.

More than one-fifth of all railroad employees are *equipment mainte-*



nance workers, who service and repair locomotives and cars. This group includes car repairers, machinists, electrical workers, sheet-metal workers, boilermakers, and blacksmiths.

Property maintenance workers, who make up about one-sixth of all railroad employees, build and repair tracks, tunnels, signals, and other railroad property. Track workers repair tracks and roadbeds. Bridge and building workers construct and repair bridges, tunnels, and other structures along the right-of-way. Signal workers install and service the railroads' vast network of signals, including highway-crossing protection devices.

The accompanying chart shows the 1976 distribution of railroad employment among the four occupational groups. Detailed information about some occupations within these groups is given elsewhere in the *Handbook*.

Training, Other Qualifications, and Advancement

Most beginning railroad workers are trained on the job by experienced employees. Training for some office and maintenance jobs is available in high schools and vocational schools. Universities and technical schools offer courses in accounting, engineering, traffic management, transportation, and other subjects that are valuable to professional and technical workers.

New employees in some occupations, especially those in operating service jobs such as locomotive engineer, start as "extra board" workers. They substitute for regular workers who are on vacation, ill, or absent for other reasons. They also may be called when railroad traffic increases temporarily or seasonally.

Extra board workers with enough seniority move to regular assignments as they become available. The length of time a new worker spends on the extra board varies according to the number of available openings. Some workers do not receive regular assignments for many years.

Beginners in shop trades usually are high school graduates with no previous experience, although some shop laborers and helpers are promoted to the trades. Shopworkers serve apprenticeships that last 3 to 4 years, depending on how much previous work experience the apprentice has.

Most applicants for railroad jobs must pass physical examinations. Those interested in traincrew jobs need excellent hearing and eyesight. Color-blind persons are not hired as locomotive engineers or brake operators or for any other jobs that involve interpreting railroad signals.

Railroad workers are promoted on the basis of seniority and ability. Job openings are posted on bulletin boards and workers may bid for them. The worker who is highest on the seniority list usually gets the job. To be promoted, however, workers may have to qualify by passing written, oral, and practical tests. Advancement in train and engine jobs is along established lines. All conductors, for example, are chosen from qualified brake operators.

Besides determining advancement procedures, seniority also gives workers some choice of working conditions. A telegrapher, for instance, may have to work several years on the night shift at out-of-the-way locations before finally getting a day shift assignment near home.

Employment Outlook

The long-run decline in railroad employment is expected to continue through the mid-1980's, but at a decreasing rate. Nevertheless, thousands of job opportunities will develop each year as the industry replaces some experienced workers who retire, die, or transfer to other fields of work.

Despite an expected increase in freight traffic, railroad employment will decline as technical innovations increase worker productivity. For example, as automatic classification systems are installed in more yards, fewer yard workers will be needed to assemble and disassemble trains. The installation of wayside scanners, which identify cars electronically, will reduce the need for clerical workers.

Most people working in passenger service may eventually work for AMTRAK, the National Railroad Passenger Corporation, created in 1971 to revive train passenger service.

Earnings and Working Conditions

Nonsupervisory railroad employees averaged $6.88 an hour in 1976, about two-fifths higher than the average for all nonsupervisory workers in private industry, except farming.

Earnings of railroad workers vary widely, however, depending on the occupation. For example, in 1976 average hourly earnings for locomotive engineers in passenger service were $12.71; for freight service brake operators $7.96; for railway clerks, $6.39; and for track gang members, $5.89. Regional wage differences are much less in railroading than in other industries because of nationally negotiated labor contracts.

Most railroad employees work a 5-day, 40-hour week, and receive premium pay for overtime. However, operating employees often work nights, weekends, and holidays. Extra board workers may be called to duty on short notice and at any time. Bridge and building workers, signal installers, and track workers may work away from home for days at a time.

Sources of Additional Information

Additional information about occupations in the railroad industry may be obtained from local railroad offices. For general information about the industry, write to:

Association of American Railroads, American Railroads Building, 1920 L St. NW. Washington, D.C. 20036.

BRAKE OPERATORS

(D.O.T. 910.364 and .884)

Nature of the Work

Brake operators play a pivotal role in making locomotives and cars into trains. Working with engineers and under the direction of conductors, they do the physical work involved in adding and removing cars at railroad stations and assembling and disassembling trains in railroad yards.

All passenger and most freight traincrews include two road brake operators—one in the locomotive with the engineer and another in the caboose with the conductor. A few small freight trains need only one in the locomotive. Before departure, road brake operators inspect the train to make sure that all couplers and airhoses are fastened, that handbrakes on all the cars are released, and that the airbrakes are functioning correctly. While underway they regularly look for smoke, sparks, and other signs of sticking brakes, overheated axle bearings, and other faulty equipment. They may make minor repairs to airhoses and couplers. In case of unexpected stops, brake operators set out signals to protect both ends of the train.

Yard brake operators help assemble and disassemble trains in railroad yards.

When freight trains approach an industrial site, the brake operator in the locomotive jumps off the moving train and runs ahead to switch the train to the proper track. The brake operators uncouple cars that are to be delivered and couple those that are to be picked up.

On passenger trains, brake operators regulate car lighting and temperature, and help the conductor collect tickets and assist passengers.

Yard brake operators (also known as yard couplers or helpers) help assemble and disassemble trains in railroad yards, according to instructions from yard conductors. They use hand signals or two-way radios to signal engineers where to move cars. Railroad cars generally are not pushed very far by the engine, but instead are allowed to roll to their destination in the yard. Brake operators uncouple the cars and throw track switches to route them to certain tracks if they are to be unloaded, or to an outgoing train if their final destination is further down the line. They may ride a car, operating the handbrake to regulate its speed.

Training, Other Qualifications, and Advancement

On most railroads, beginning brake operators make several trips with conductors and experienced operators to become familiar with the job. Their names are then put on the "extra board" and they are given assignments to substitute for workers who are absent for vacations, illness, or other reasons. On some railroads, however, new brake operators first are given several days of training, including instruction on signaling, coupling and uncoupling cars, throwing switches, and boarding moving equipment. Following this training period, these brake operators accompany experienced crews for several trips before being placed on the "extra board." It usually takes several years before brake operators acquire enough seniority to get regular assignments.

Employers prefer applicants who are high school graduates or the equivalent. Good eyesight and hearing are essential. Mechanical aptitude is helpful. Physical stamina is necessary to board moving trains, throw switches, and operate handbrakes. Most employers require that applicants pass physical examinations.

With sufficient seniority, brake operators may become conductors. These jobs are always filled by promoting experienced brake operators who have qualified by passing written and oral tests on signals, brake systems, timetables, operating rules, and other subjects. Some companies require that these tests be passed within the first few years of the brake operator's employment. Since promotions on almost all railroads are controlled by seniority rules, brake operators usually wait at least 10 years before becoming conductors. Advancement is limited by the number of conductor jobs, and there are many more brake operators than conductors. A few brake operators in freight service move to passenger service, usually considered more desirable because it is less strenuous.

Employment Outlook

Employment of brake operators—who numbered nearly 65,000 in 1976—is not expected to change through the mid-1980's. Employment is expected to increase in the short run, however, as an improving economy leads to more freight traffic. Although many of the available openings will be taken by experienced brake operators now on furlough, some jobs will be available for new workers. Openings also will develop as experienced brake operators retire, die, advance to jobs as conductors, or transfer to other work.

Even though total employment of brake operators is not expected to change in the long run, the number of those in road service will increase since more trains will be needed to haul the additional freight volume created by growth in population and industry. Employment gains will be moderated, however, by innovations that make it possible to move freight more efficiently. For example, trains will be able to carry more freight as the railroads continue to replace older freight cars with larger, better designed ones.

The number of yard brake operators is expected to decrease, primarily due to the installation of automatic classification systems in more yards. In an automatic classification yard, cars are braked and routed by electronic controls. Fewer brake operators are needed in these yards, mainly to connect airhoses, uncouple cars, and retrieve misrouted ones. Yard employment also will be affected by the new freight cars, which take as much time to route as older ones but carry more freight.

Earnings and Working Conditions

In 1976, brake operators had average monthly earnings of $1,206 in yard service, $1,523 in freight service, and $1,537 in passenger service. These earnings were about twice as much as the average for all nonsupervisory workers in private industry, except farming.

Yard brake operators usually work a scheduled 40-hour week and receive premium pay for overtime. Road brake operators are paid according to miles traveled or hours worked, whichever is greater. Brake operators often work nights, weekends, and holidays.

Most freight trains are unscheduled so few road brake operators have scheduled assignments. Instead, their names are placed on a list and when their turn comes they are assigned the next train, usually on short notice and often at odd hours. Since freight and passenger brake operators often work on trains that operate between terminals that are hundreds of miles apart, they may spend several nights a week away from home. Brake operators assigned to extra board work have less steady work, more irregular hours, and lower earnings than those with regular jobs.

Most brake operators are members of the United Transportation Union.

CONDUCTORS

(D.O.T. 198.168)

Nature of the Work

Conductors are in charge of train and yard crews. They are responsible

for the safe and punctual delivery of cargo and passengers and the accurate assembly of trains.

Before a train leaves the terminal, the conductor receives instructions on the train's route, timetable, and cargo from the dispatcher, and discusses these with the engineer. On many trains conductors can receive additional information by radio while underway. This may include information about track conditions ahead, or instructions to pull off at the next siding to let another train pass.

During runs, conductors use two-way radios to contact engineers. They pass on instructions received from dispatchers and remind engineers of stops, reported track conditions, and the presence of other trains. Conductors regularly receive information from brake operators on the condition of the cars. If a problem occurs, conductors arrange either for repairs while underway or for removal of the defective car at the nearest station or siding. They inform dispatchers of this development using radio or wayside telephones.

On freight trains, the conductor keeps records of each car's contents and destination, and sees that cars are added and removed at the proper points along the route. On a passenger train, conductors collect tickets and fares, and answer passengers' questions concerning timetables and train rules. At stops they signal engineers when to leave.

Yard conductors supervise the crews that assemble and disassemble trains. They receive instructions from yardmasters concerning where to move the cars of newly arrived trains. Some cars will be sent to special tracks for unloading, while the rest will be moved to other tracks to be made into trains going to different cities. Conductors tell engineers where to move cars while brake operators are told which cars to couple and uncouple and which switches to throw to divert the locomotive or cars to the proper track. In yards that have automatic classification systems, conductors may use electrical controls to operate the track switches that route cars to the correct track.

Conductors receive instructions by radio while underway.

Training, Other Qualifications, and Advancement

Jobs as conductors always are filled from the ranks of experienced brake operators who have passed tests covering signals, timetables, operating rules, and related subjects. Until permanent positions become available, new conductors are put on the "extra board," where they substitute for experienced conductors who are absent because of illness, vacations, or other reasons. On most railroads, conductors on the extra board may work as brake operators if there are not enough conductor runs available for them that month. Seniority almost always is the main factor in determining promotion from brake operator to conductor and from the extra board to a permanent position.

Most railroads maintain separate seniority lists for road service and yard service conductors; conductors usually remain in one type of service for their entire careers. On some roads, however, conductors start in the yards, then move to freight service, and finally to passenger service. Some conductors advance to managerial positions such as trainmaster or yardmaster.

Employment Outlook

Employment of conductors—who numbered about 35,900 in 1976—is expected to grow more slowly than the average for all occupations Most job openings will result from the need to replace conductors who are promoted, or who retire or die.

The transportation requirements of the country will increase as growth in population and industry creates a demand for more consumer and industrial products. This will result in an increase in employment of road service conductors, since more trains will be needed to haul the additional freight volume. However, employment growth will be moderated by innovations that make it possible to move freight more efficiently. For example, trains will be able to carry

more freight as the railroads continue to replace older freight cars with larger, better designed ones.

Employment of yard conductors, on the other hand, is not expected to change. Continued modernization of yards, especially the addition of automatic classification systems, will improve yard efficiency. Yard employment also will be affected by the new freight cars which take as much time to route as older ones but carry more freight.

Earnings and Working Conditions

In 1976, conductors had average monthly earnings of $1,489 in yard service, $1,626 in passenger road service, and $1,829 in freight road service. These earnings were more than double the average for all nonsupervisory workers in private industry, except farming.

Yard conductors usually work a scheduled 40-hour week and receive premium pay for overtime. Road conductors are paid according to miles traveled or hours worked, whichever is greater. Conductors often work nights, weekends, and holidays.

Most freight trains are unscheduled so few road conductors have scheduled assignments. Instead, their names are placed on a list and when their turn comes they are assigned the next train, usually on short notice and often at odd hours. Since road service conductors often work on trains that operate between stations that are hundreds of miles apart, they may spend several nights a week away from home. Conductors on the extra board frequently work less than 40 hours a week as conductors and, therefore, earn less than those who have regular jobs.

Many conductors are members of the United Transportation Union.

LOCOMOTIVE ENGINEERS

(D.O.T. 910.383)

Nature of the Work

Engineers are among the most skilled employees on the railroad. They must have a thorough knowledge of the signal systems, yards, and terminals along their route and be constantly aware of the condition and makeup of the train. Trains react differently to acceleration, braking, and curves, depending on the number of cars, the ratio of empty to loaded cars, or the amount of slack in the train. Misjudgment by the engineer of these or many other factors can lead to whiplash injuries to passengers and crew members, damaged cargo, broken couplers, or even derailment.

Engineers operate locomotives in passenger, freight, and yard services. Road service engineers transport cargo and passengers between stations, while yard engineers move cars within yards to assemble or disassemble trains. Most engineers run diesel locomotives; a few run electrics.

Engineers operate the throttle to start and accelerate the train and use airbrakes to slow and stop it. They also watch gauges and meters that measure speed, fuel, battery charge, and air pressure in the brake lines. Both on the road and in the yard, they watch for signals that indicate track obstructions and speed limits.

Before and after each run, engineers check locomotives for mechanical problems. Minor adjustments are made on the spot, but major defects are reported to the engine shop supervisor.

Training, Other Qualifications, and Advancement

Openings in engineer jobs on the majority of railroads are filled by training and promoting engineer helpers according to seniority rules. Some railroads, though, train applicants directly as engineers. A few train brake operators.

Helpers ride in locomotives with engineers and assist them by inspecting locomotives, watching for signals and track obstructions, and monitoring gauges. New helpers receive on-the-job training lasting up to 6 weeks during which time they learn their duties and railroad rules and regulations. They are then assigned as engineer helpers on regular jobs.

Railroads prefer that applicants for helper and engineer positions have a high school education and be at least 21 years old. Applicants must have good hearing, eyesight, and color vision. Good eye-hand coordination, manual dexterity, and mechanical aptitude also are required.

Engineers watch for signals that indicate track obstructions and the need to lower speed.

Helpers are placed in training programs for engineer jobs within 1 year following their initial hiring date. These programs, and those for engineer trainees and brake operators, include classroom and on-the-job training in locomotive operation. Many programs include extensive training on simulators. At the end of the training period, the potential engineers take qualifying tests covering locomotive equipment, airbrake systems, fuel economy, train handling techniques, and operating rules and regulations.

As engineers are needed, newly trained engineers or qualified helpers who have the longest seniority are placed on the engineers' "extra board." Extra board engineers who do not have regular assignments substitute for regular engineers who are absent because of vacation, illness, or other reasons. Extra board engineers frequently have to wait a number of years before accumulating enough seniority to get a regular assignment. Seniority rules also may determine the engineers' type of service; for instance, from a first regular assignment in yard service, they may move to road service.

Engineers take periodic physical examinations to determine fitness to operate locomotives. They must have keen eyesight and hearing. Those who fail to meet the physical standards are restricted to yard service.

Employment Outlook

Employment of locomotive engineers—who numbered about 33,300 in 1976—is expected to increase more slowly than the average for all occupations through the mid-1980's. Most job openings will arise from the need to replace engineers who retire or die.

The need for transportation services will increase as growth in population and industry creates a demand for more consumer and industrial products. This will result in an increase in employment of road service engineers, since more trains will be needed to haul the additional freight volume. However, this employment growth will be moderated by innovations that make it possible to move freight more efficiently. For example, trains will be able to carry more freight as the railroads continue to replace older freight cars with larger, better designed ones.

Employment of yard engineers, on the other hand, is not expected to change. Continued modernization of yards, especially the addition of automatic classification systems that electronically route cars to the proper track, will improve yard efficiency. Yard employment also will be affected by the new freight cars, which take as much time to route as older ones but carry more freight.

Earnings and Working Conditions

The earnings of engineers depend on the size of the locomotive and type of service. In 1976, monthly earnings of engineers averaged $1,634 in yard service, $2,008 in passenger service, and $2,080 in freight service. Engineers earned two to three times as much as the average for all nonsupervisory workers in private industry, except farming.

Yard engineers work 5 days or more a week, depending on the railroad. Their hours are scheduled and they receive premium pay for working more than 8 hours in any day. Road service engineers are paid by miles traveled or hours worked, whichever is greater. Many railroads place a maximum on the number of miles a road service engineer can cover per month. Those who reach the limit are replaced by extra board engineers for the rest of the month. Engineers often work nights, weekends, and holidays at regular pay.

Most freight trains are unscheduled so few road engineers have scheduled assignments. Instead, their names are placed on a list and when their turn comes they are assigned the next train, usually on short notice and often at odd hours. Since those in road service may deliver cargo or passengers to a distant station one day and not return until the next, they may spend several days a week away from home. Engineers assigned to the extra board have less steady work, more irregular hours, and lower earnings than those with regular jobs.

Most engineers are members of the Brotherhood of Locomotive Engineers; some are members of the United Transportation Union.

SHOP TRADES

Nature of the Work

Every railroad employs its own workers to maintain, repair, and rebuild railroad cars, locomotives, and other equipment. In 1976, there were over 72,600 workers in the six principal shop trades—about 38,300 car repairers, 16,300 machinists, 10,900 electrical workers, 4,500 sheet-metal workers, 1,400 boilermakers, and 1,100 blacksmiths. These skilled craft workers are employed in railroad yards, terminals, and engine houses, as well as in major car and locomotive repair facilities.

Car repairers (D.O.T. 622.381) keep freight and passenger cars, tank cars, and some sections of locomotives in good running condition. Some repairers specialize in visually examining cars and locomotives every time they enter yards. They inspect parts such as wheels, brake assemblies, and couplers, looking for defects that might lead to accidents or delays. They may make minor repairs on the spot, but defective cars usually are fixed on special tracks by other car repairers. These repairs include straightening ladders on freight cars, fixing leaks in car roofs, changing wheels, and replacing couplers.

Some car repairers work in special yards rebuilding old or badly damaged cars. They also may convert standard cars received from manufacturers into custom-built ones for specialized purposes.

The other shop workers are involved primarily with servicing locomotives. Locomotives are overhauled on a regular basis and each craft plays a role in the inspection and repair of defective or damaged locomotives.

Although a few machinists use metal cutting and forming tools to repair parts of locomotives, most do mechanical work on engines. During overhauls, *machinists* (D.O.T.

Some repairers rebuild old or badly damaged cars or convert standard cars into custom-built ones for specialized purposes.

600.280) examine valves, transmissions, fuel lines, and other components for damage or wear. During major overhauls they may strip the engine completely. Exterior components, such as wheels and axles, also are inspected and any defective or worn parts are replaced.

During these overhauls, *electrical workers* (D.O.T. 721.381) repair or install new wiring and inspect the generator and electric motors in the engine. They also maintain air-conditioning systems and the cooling systems in refrigeration cars. Some maintain the wiring in railroad buildings.

Machinists and electrical workers also examine engines that have mechanical or electrical problems. Much of this work is done in the shop, but if a locomotive breaks down up the track, a team consisting of a skilled machinist and an electrical worker is sent to the site to attempt to repair it on the spot.

Sheet-metal workers (D.O.T. 804.281) and *boilermakers* (D.O.T. 805.281) repair sheet-metal sections of locomotives and the pipes and tubes in locomotive engines. They also work on other equipment made of steel plates such as stationary boilers and tanks. *Blacksmiths* (D.O.T. 610.381) repair locomotive frames and other heavy metal parts. More information on machinists, electricians, boilermakers, and blacksmiths can be found elsewhere in the *Handbook*.

Training, Other Qualifications, and Advancement

Although apprenticeship training is the most common way to enter shop trades, some helpers and laborers are upgraded to these jobs. Apprenticeships last 3 to 4 years, depending on how much previous work experience the apprentice has.

Most apprentices are between 18 and 21 years of age, although some are older at the start of their training. On some roads, apprentice applicants must pass mathematical and mechanical aptitude tests.

Applicants who have had shop training in high schools or vocational schools are preferred by most railroads. Automobile repair and machining courses are useful for machinists. Courses in electricity and physics will help applicants who want jobs as electrical workers.

Some workers in the shop trades advance to supervisory positions.

Employment Outlook

Employment of shop trades workers is expected to decline through the mid-1980's as shop efficiency continues to increase and as older railroad cars are replaced with new ones that are more durable and more easily maintained. However, job openings will develop for new apprentices or helpers as experienced workers retire, die, or transfer to other fields of work.

Earnings and Working Conditions

In 1976, hourly earnings averaged $7.00 for electrical workers, $6.98 for boilermakers, $6.94 for machinists, $6.87 for blacksmiths, $6.90 for car repairers, and $6.96 for sheet-metal workers. Most shopworkers have a 40-hour workweek and receive premium pay for overtime.

Shopwork is active and strenuous, involving stooping, climbing, and lifting. In addition, much of the work of car repairers is done outdoors in all kinds of weather. Other workers face noisy shop conditions.

Most shopworkers are union members. Among the unions in this field are: Brotherhood of Railway Carmen of the United States and Canada; International Association of Machinists and Aerospace Workers; International Brotherhood of Electrical Workers; Sheet Metal Workers' International Association; International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers; Transport Workers Union of America; and the International Brotherhood of Firemen and Oilers. Several of these unions negotiate labor-management agreements through the Railway Employes' Department of the AFL-CIO.

SIGNAL DEPARTMENT WORKERS

(D.O.T. 822.281 and .884)

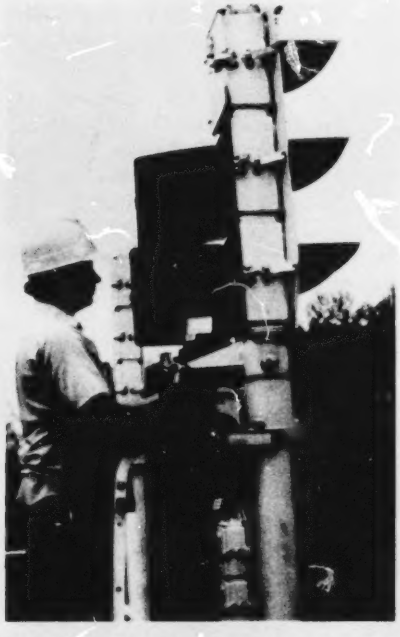
Nature of the Work

Railroad signal workers install, repair, and maintain the train control, communication, and signaling sys-

tems that direct train movement and assure safety. These include gate crossings and signal lights, as well as systems that operate signals and throw switches by remote control. The work usually consists of either general maintenance of the signal systems or installation and major repair.

Signal installers work in crews, usually consisting of at least five workers. They install new equipment and make major repairs. They do mostly construction work that includes digging holes and ditches, hoisting poles, and mixing and pouring concrete to make foundations. They also assemble the control and communications devices, make the electrical connections, and perform the extensive testing that is required to assure that new signal systems work properly.

Individual *signal maintainers* are assigned a section of track and are responsible for keeping gate crossings, signals, and other control devices within their section in good operating condition. They periodically inspect and repair or replace wires, lights, and switches. They may have to climb poles to reach signals and sometimes work near high voltage wires. Signal maintainers and installers must have a thorough knowledge of electricity and electronics.



Signal maintainer carefully checks lights.

Training, Other Qualifications, and Advancement

New employees usually are assigned as helpers to installation crews. After a 60- to 90-day probationary period, helpers are eligible to advance to assistants. Some railroads hire applicants directly as assistants. After 2 to 4 years, which may include classroom instruction, qualified assistants are promoted to signal installer or maintainer. Assistants usually advance to signal installer, though, since openings in the more desirable maintenance positions usually are filled by senior signal installers. These promotions and assignments are made on the basis of seniority, provided ability is sufficient.

When hiring helpers or assistants, railroads prefer applicants who are high school or vocational school graduates. Courses in blueprint reading, electricity, and electronics provide a helpful background. Applicants also should be capable of doing heavy work.

Both signal installers and maintainers may be promoted to signal inspector or technician. Technicians assist installers with complicated systems while inspectors check the work of both installers and maintainers. Some installers and maintainers become gang supervisors and a few advance to higher supervisory positions.

Employment Outlook

Employment of signal department workers—who numbered about 11,500 in 1976—is not expected to change significantly through the mid-1980's. Nevertheless, some job openings for new workers will arise as experienced workers retire, die, or transfer to other fields.

Signal workers will continue to be needed to repair the existing stock of equipment as well as install and maintain the new signal and train control systems that are planned for the future. Employment is not expected to grow, however, since many new signal systems, which have fewer moving parts, require less maintenance. Employment also will be affected as the railroads continue to close some sections of track that are unprofitable or are made unnecessary as the installation of improved train control systems enables railroads to use less track.

Earnings and Working Conditions

In 1976, signal installers and maintainers averaged $6.77 an hour, about two-fifths more than the average for all nonsupervisory workers in private industry, except farming. Assistants averaged $5.85 an hour and helpers $5.74 an hour. Most signal workers have a 40-hour week and receive premium pay for overtime.

Since they work over large sections of track, installers usually live away from home during the workweek, frequently in camp cars provided by the company. Maintainers usually live at home and service signals over a limited stretch of track. However, they must make repairs regardless of weather conditions or time of day.

Most signal installers and maintainers are members of the Brotherhood of Railroad Signalmen.

STATION AGENTS

(D.O.T. 211.468. and 910.138)

Nature of the Work

Station agents are the customers' contact with the railroad. Most agents work in small freight stations. They take orders from companies that need cargo shipped and arrange for railroad cars to transport their product. When loaded cars are delivered to a station, the agent inspects the merchandise for damage and informs the recipient that the goods are ready for unloading. Agents prepare customer bills and must be knowledgeable about the complex railroad billing procedure. Agents also may pass on train orders and other messages to train crews. At larger stations, many of these tasks may be done by clerks, telephoners, and oth-

ers who are under the agent's supervision.

At passenger stations, agents supervise and coordinate the activities of workers who sell tickets and check baggage. At major freight and passenger stations, the agent's duties are primarily administrative and supervisory.

Some agents, sometimes called mobile agents, service several small stations that get little business. They travel from station to station, opening each only long enough to transact the business at hand.

Training, Other Qualifications, and Advancement

Station agents rise from the ranks of other railroad occupations. With sufficient seniority and ability, telephoners, telegraphers, tower operators, and clerks may be promoted to agents in small stations and may advance to larger stations as they gain additional seniority. Agents also may be promoted to managerial positions such as supervisory agent or auditor.

Employment Outlook

Employment of station agents—who numbered about 7,000 in 1976—is expected to decline through the mid-1980's as more customer orders and billing are handled at large, centrally located stations, and as an increasing number of smaller stations are serviced by mobile agents. Nevertheless, a limited number of jobs will arise from the need to replace experienced agents who retire, die, or stop working for other reasons.

Earnings and Working Conditions

The earnings of station agents vary. In 1976, agents in small stations averaged $6.75 an hour, while agents in major stations averaged $8.21 an hour. A 40-hour workweek is standard, and time and one-half is paid for overtime.

Station agents are members of the Brotherhood of Railway, Airline and Steamship Clerks, Freight Handlers, Express and Station Employees.

TELEGRAPHERS, TELEPHONERS, AND TOWER OPERATORS

(D.O.T. 236.588 and 910.782)

Nature of the Work

The movements of trains on many sections of track are directed from central locations. Switches are thrown by remote control and crews are contacted by radio. Where this centralized control has not been put into effect, however, trains are controlled by telegraphers, telephoners, and tower operators.

Tower operators work in towers located in railroad yards or at major junctions on the outskirts of cities. Following instructions given by dispatchers and yardmasters, they route train traffic by operating controls that activate signals and throw switches on the track below. By throwing switches, a tower operator in a yard can route trains to other yards within the city, onto industrial tracks to pick up or deliver cars, or to a main track leaving the city. Once a train is outside the city, a tower operator directs it from the main track to tracks leading to other cities. By controlling signals, tower operators also can pass on instructions to train crews. For example, if a yard is full, the yardmaster will instruct a tower operator to signal an approaching train to wait outside the city, rather than have it block streets while waiting its turn at the entrance to the yard.

Telegraphers and telephoners work in yards and stations. They receive orders on train movement from dispatchers and pass this information on to train crews, either verbally or in written instructions. These orders may include information on a train's route or directives to maintain lower speed limits because of poor track conditions. Those at stations assist station agents in taking orders and billing customers.

Training, Other Qualifications, and Advancement

Jobs as telegraphers, telephoners, and tower operators are filled from the ranks of clerical workers according to seniority provisions. It takes several years for a newly hired clerk to acquire sufficient seniority to advance to one of these positions.

New telegraphers, telephoners, and tower operators receive on-the-job training that covers operating rules, train orders, and station operations. On most roads, trainees must pass examinations on train operating rules and demonstrate their ability to use the equipment before they can qualify. Newly qualified workers usually are assigned to the "extra board" to work as substitutes for telegraphers, telephoners, and tower operators who are absent due to vacations, illness, or other reasons. After gaining enough seniority, they generally can bid for regular assignments.

Telegraphers, telephoners, and tower operators should be responsible and alert. In addition, tower operators should be capable of organizing thoughts and actions in emergency or pressure situations. Good hearing and eyesight, including normal color vision, are required.

A few telegraphers, telephoners, and tower operators advance to positions as station agent or train dispatcher.

Employment Outlook

Employment of telegraphers, telephoners, and tower operators—who numbered about 10,200 in 1976—is expected to decline through the mid-1980's. Nevertheless, a small number of clerks will be promoted to replace experienced workers who retire, die, or change occupations.

Employment in these fields will continue to decline as technological developments increase worker productivity through the wider use of mechanized yard operations, centralized traffic control, and other automatic signaling and control systems.

Earnings and Working Conditions

In 1976, hourly earnings for telegraphers, telephoners, and tower operators averaged $6.57, about one-third more than the average for all nonsupervisory workers in private industry, except farming. A 40-hour week is standard, and time and one-half is paid for overtime.

Most telegraphers, telephoners, and tower operators are members of the Brotherhood of Railway, Airline and Steamship Clerks, Freight Handlers, Express and Station Employees.

TRACK WORKERS

(D.O.T. 182.168, 859.883, 869.887, and 910.782)

Nature of the Work

A major factor limiting train speed is the quality of the track. Many locomotives are capable of pulling hundreds of cars at speeds as fast as 75 miles an hour, but train speed must drop sharply on poorly maintained track to avoid accidents. Preventing track deterioration and the accompanying loss in railroad efficiency is the job of track workers, who service, repair, and replace railroad track and roadway.

Most track workers are members of large, heavily mechanized traveling crews which do scheduled preventive maintenance and major repair work over hundreds of miles of track. Many of these workers operate heavy machinery, such as bulldozers, cranes, and machines which they use to lay rail, replace ties, or clean ballast. Others use power tools to drive and pull spikes, cut rails, and tighten bolts. Handtools, such as picks and shovels, are used less frequently.

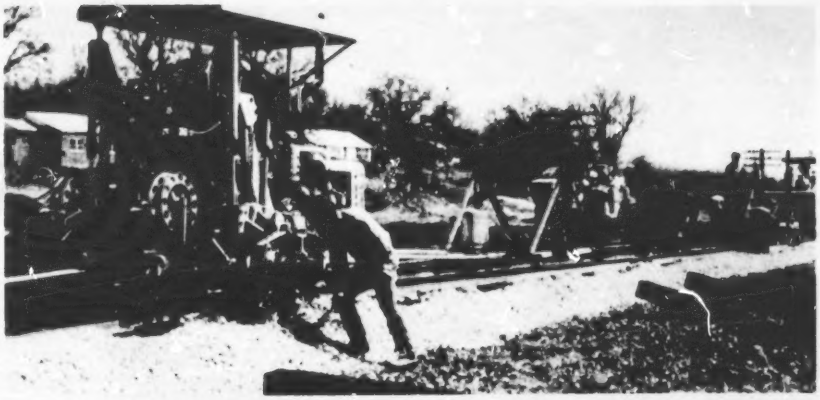
Section crews, which are smaller and less mechanized than the traveling ones, do less extensive repairs. They are assigned a smaller section of track to keep in condition between the major overhauls of the traveling crews. Section workers regularly inspect the track and roadway, and repair or replace malfunctioning switches, weak ties, cracked rails, washouts, and other defects.

Training, Other Qualifications, and Advancement

Most track workers learn their skills through on-the-job training that lasts about 2 years. Machine-operating jobs are assigned to qualified workers by seniority.

Railroads prefer applicants who can read, write, and do heavy work. Applicants may be required to pass physical examinations.

Some track workers who have the necessary seniority and other qualifications may advance to gang or section supervisor, then to positions such as track supervisor.



Track workers laying rail.

Employment Outlook

Employment of track workers—who numbered about 56,200 in 1976—is not expected to change through the mid-1980's. But employment is expected to increase in the short run as funds for track renovation become available through government action.

Railroads are expected to upgrade much of the right-of-way in an effort to increase efficiency, and the speed and extent of this renovation will determine the need for additional workers. Over the long run, however, increased productivity of track workers—as machines do more of the work—will moderate employment needs. In addition, railroads will continue to close some sections of track that are unprofitable or are made unnecessary as the installation of improved train control systems enables railroads to use less track. Despite this lack of growth, new track workers will be needed each year to replace experienced workers who retire, die, or transfer to other occupations. Most job openings will be in traveling crews.

Earnings and Working Conditions

In 1976, track workers averaged $5.89 an hour, slightly more than the average for all nonsupervisory workers in private industry, except farming. Equipment operators and helpers averaged $6.16 and crew supervisors averaged $6.54 an hour. A 40-hour workweek is standard, and premium rates are paid for overtime. Some track workers, especially those working on traveling crews on the northern railroads, are furloughed during the winter months.

Track workers on traveling crews may have to commute long distances to reach the worksite. Many, however, live in camp cars or trailers provided by the railroads. Workers on section crews sometimes have to perform emergency repairs at night during bad weather conditions. Track workers have strenuous and active jobs. The tools they use are fairly heavy and they often work in bent and stooped positions.

Most track workers are members of the Brotherhood of Maintenance of Way Employees.

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